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Honorary Editor: JOHN HYDE

Honorary Associate Editors

A. W. GREELY W J McGEE ELIZA RUHAMAH SCIDMORE

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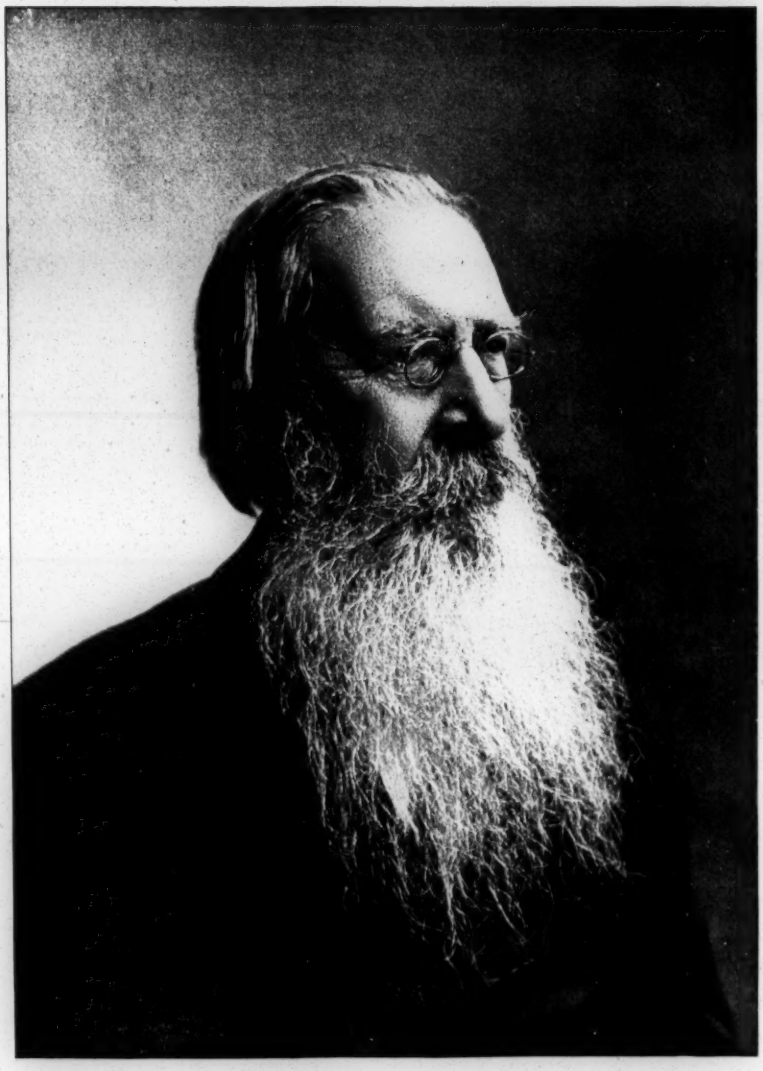
NOTE.—The delay in the publication of this number of THE NATIONAL GEOGRAPHIC MAGAZINE is due to the repeated failure of the engravers to reproduce to the satisfaction of the Editors of the Magazine the admirable portrait of President Hubbard recently taken at their request. It is hoped that the faithful likeness and striking picture that has finally been secured will be accepted by the members of The National Geographic Society and the subscribers to the Magazine as a justification of a delay that is regretted by no one more than by the Editors themselves.



HON. GARDINER GREENE HUBBARD, LL. D.,
President of the National Geographic Society.

THE

National Geographic Magazine

VOL. VII MAY, 1896 No. 5

AFRICA SINCE 1888, WITH SPECIAL REFERENCE TO SOUTH AFRICA AND ABYSSINIA*

By Hon. GARDINER G. HUBBARD, LL. D.,

President of the National Geographic Society

Eight years ago I selected Africa as the subject of my annual address before the National Geographic Society. Since then the nations of Europe, seeking new outlets for trade and possible homes for their surplus population, have taken possession of the larger part of the continent. They have developed Africa more rapidly than in any preceding age, and have greatly increased our knowledge of it.

Africa and America were discovered about the same time—the one by Portugal, the other by Spain. Soon afterward the slave trade was established between the two continents to supply the place of Indian labor, the natives of America, unable to stand the tasks imposed upon them by the Spaniards, having been exterminated. This trade proved so profitable that England soon took part in it, exchanging her products for slaves transported to the Spanish colonies in America. This continued for two hundred and fifty years, or until the early part of the nineteenth century, when the slave trade was abolished and the trade in intoxicating liquors substituted, which has been to the African a greater evil than the slave trade. A recent writer says that four million gallons of the most poisonous gin and rum are imported yearly into the Nagos and Niger coast protectorates.

*Annual presidential address, delivered April 24, 1896.

Nearly half a century ago two or three large mercantile firms of Hamburg and Bremen established trading stations on the west coast of Africa. Their profits were very large, as, in exchange for rum, trinkets, beads, and worthless arms, cocoanut oil, ivory, india-rubber, and other tropical products were obtained. This trade finally resulted in the starting of a regular line of steamers from Hamburg to the west coast, and also of one through the Suez canal to the east coast. Prince Bismarck realized that he had a most urgent problem to solve, either to restrain German emigration, or, failing in that, to keep it under the control of the empire. America was closed; Asia was all taken; his only opportunity was colonization in Africa. He ordered German ships of war to visit the African coast, and established consulates at different ports. Treaties were made with the natives for the purpose of acquiring colorable titles to large tracts of land, the German flag was raised, and the country declared to be under German protection. These settlements are merely stations, where two or three families of foreign merchants reside, and outstations of natives—middlemen, who carry on the trade between the natives of the interior and the foreigners on the coast. Germany also claims the hinterland or interior country behind the stations, although most of it had been regarded by the English as under their flag.

At the time of the uprising in Egypt against the rule of England and France, in 1882, France declined to act with England, but soon bitterly regretted her mistake, and to offset her loss in Egypt she extended her dominion in northwest Africa and on the Gold Coast and the upper Niger, although most of these regions had been claimed by English traders. About the same time the Kongo Free State was founded and claimed the whole of the Kongo valley. This was opposed by both France and Portugal, the one claiming the country north of the Kongo, the other that to the south. Thus in 1883 and 1884 it seemed that all the great nations of Europe might come into conflict regarding their different claims in Africa. For the purpose of settling these questions and defining the rights of each country, Germany, France, Belgium, Portugal, and England held a conference at Berlin in 1884, to which the United States was invited, the only conference between the great powers, relating to foreign affairs, in which it has participated. At this convention and by subsequent agreements made between 1885 and 1895 the European powers fixed the boundaries of their several African possessions.

It was determined that free navigation and free trade should be established for all nations within the regions watered by the Kongo and its affluents—a right subsequently annulled—and on the Zambesi to a point five miles above the mouth of the Shiré, and free trade for transit to regions on the Niger beyond British influence.

Under these agreements England and France each claim a little more than twenty-five per cent of the Continent; Portugal, Germany, and Belgium together claim about twenty-three per cent. The other European powers, with the Boers of the Transvaal and the sultan of Turkey, together hold about twelve per cent, leaving to the Africans the desert of Sahara and part of the Sudan, about fifteen per cent. This gives to the European powers, having no right but that of might, all those portions of Africa supposed to be habitable or valuable.

It has been the policy of Great Britain to allow her merchants to establish commercial relations with the natives by opening trading-stations, but not until the trade becomes profitable, and private enterprise and money have established the value of the trade, to raise her flag, claim them as British possessions, and exercise governmental control. The East Indian empire was the outgrowth of a trading-station. France and Germany reversed this policy, first taking possession of different parts of Africa, establishing territorial governments, and afterward offering inducements to mercantile companies to establish trading-stations and in addition guaranteeing protection from the natives. England as a result of her policy—the flag following the trade—has secured the most valuable parts of Africa.

France holds an immense territory on the Mediterranean, with Algiers as its capital, the country south of Algiers and west of Senegambia, and on the upper waters of the Niger, while England claims the Niger and Benue, the only navigable rivers in Africa. England formerly claimed Damaraland and Namaqualand, on the southwest coast of Africa, but yielded them to Germany, reserving a small tract of land near the center of the territory, Walfish bay, the only good harbor on the coast and the best means of access to the interior of the German possessions.

England allowed Germany to secure a vast region in East Africa over which she had claimed dominion, but claims for herself a large portion of South Africa, the Shiré and the upper waters of the Zambesi, the part of Africa best fitted for the occupation of Europeans. She retained Egypt, allowing France to

acquire Tunis and the desert of Sahara. She yielded to Italy the southwest coast of the Red sea and south on the Indian ocean to the river Juba, including Massowah, the most unhealthy part of the Red sea, on condition that Italy should occupy Kassala and drive out the Mahdists, reserving also for herself the best harbors in the Italian territory on the Indian ocean.

The occupation of Africa has cost France $750,000,000 and Italy her reputation as one of the leading powers of Europe; Germany has failed in her colonization scheme, for, as a recent writer says, her colonists in Africa number less than 1,000 and cost about $2,750 a year each, while the only portions of Africa that have yielded large returns for investments made by colonists are the regions controlled by England on the Niger and in South Africa.

THE BRITISH SOUTH AFRICAN COMPANY.

The government of these vast tracts and colonies has generally been granted to companies chartered by the governments of Europe. One of these companies, the British South African Company, was founded in 1889 by Mr Cecil Rhodes. The son-in-law of the Prince of Wales and other members of the nobility were made directors and officers, receiving full-paid founders' shares. Dr Jameson was one of the subordinate officers. The par value of the stock, £1, soon rose in the market to £3 or £4, thus securing a handsome profit to the company's noble directors. The company was authorized "to acquire by any concession, grant, or treaty all or any rights, authorities, jurisdictions, and powers of any kind or nature whatever, including powers necessary for the purposes of government, comprised or referred to in the concessions and agreement made as aforesaid or affecting other territories, lands, or property in Africa or the inhabitants thereof." Among the privileges given to it are "the right to establish banking and other companies and associations; to make and maintain railroads, telegraphs, and lines of steamships; to carry on mining operations and license mining companies; to settle, cultivate, and improve the lands; to preserve peace and order in such ways and manner as it shall consider necessary, and for that object may establish and maintain a force of police and have its own flag."

The territory originally included in the charter of the company was many times larger than Great Britain, but Mr Rhodes and his associates, still unsatisfied, penetrated into Khama's country, Matabeleland and Mashonaland, defeated Lobengula,

and added a large tract to that already under British protection. But still beyond lay richer lands, and in June, 1895, a territory called Northern Zambesia and Nyassaland, larger and more valuable than the original grant, was added to the South African Company. This was the land discovered by Dr Livingstone, settled by Scotchmen at his instance, and here on lake Bangweolo he died. The whole territory is now called Rhodesia, or Zambesia, and extends from Cape Colony north over two thousand miles past lake Nyassa, with lake Tanganyika as its northeastern boundary and the Kongo Free State its northwestern. The company now claim a territory of nearly one million square miles, an area larger than Europe exclusive of Russia.

The country is very thinly populated, and the valleys of the Limpopo and Zambesi are infested by the tsetse, a stinging fly unknown elsewhere; its bite is fatal to the horse and ox; it seems, however, to disappear with the advance of civilization. But notwithstanding this pest, Zambesia, with its great elevation, its fine climate, its fertile soil (much of it capable of cultivation by irrigation), and its great mineral deposits, may become one of the most wealthy and densely populated portions of Africa.

Within the territory of the South African Company are the richest diamond mines in the world, and just over its border, in the Transvaal, the richest gold mines.

DIAMONDS

India was formerly the only country in which diamonds were found to any great extent. They were afterward discovered in Brazil, and some of small size have been found in other places. The diamond fields of both India and Brazil appear to be nearly exhausted. The first diamond discovered in South Africa was found in 1868 near Kimberley, 620 miles north of Cape Town. Since 1870, when mines were opened, the production has rapidly increased, and in twenty-five years these mines have produced more and larger diamonds than all other countries, 98 per cent of the present production of the world coming from Kimberley.

These stones are found in a region about twelve miles in circumference, where four small hills or pipes, as they are called, rise from 60 to 80 feet above the ground, probably natural chimneys or extinct craters, lined with walls of basalt, broadening out below the surface to a great depth. These craters are filled with a blue diamantiferous formation, which has been forced to the surface of the ground by the pressure of the subterranean

gases. In this formation the diamonds are imbedded, in a regular order known to miners. Formerly the earth was thrown out from the surface until several hundred feet in depth over a large area had been removed. This method of working was dangerous and expensive, and now shafts are sunk at a little distance from the craters and the blue earth is reached by underground galleries. The workings are inclosed by high walls, within which the workmen are confined during the time of their service. Each night they are stripped and their persons and clothing subjected to a most careful examination. The secretion of diamonds or their purchase from workmen is punished most severely; but with all these precautions diamonds to the value of probably a million dollars a year are secured by the miners. Instances like the following are not uncommon: A man escaping on horseback was carefully examined and released, no diamonds being found upon him, but on crossing the border he stopped, dismounted, shot his horse, and took from the animal a small bag of these precious stones.

There were originally so many different claims and rival companies that their consolidation seemed almost impossible. It was then that Mr Cecil Rhodes first appeared prominently before the world. Through his financial genius and marvelous management the companies were consolidated into one corporation, with a capital of $20,000,000. The net profits in 1895 are said to have been over $11,000,000 from the sale of the diamonds; $5,000,000, or 25 per cent, was divided and the balance carried to a reserve fund. The production is limited to the demand, so that the market may not be overstocked and the diamond decrease in value.

TRANSVAAL, OR SOUTH AFRICAN REPUBLIC

Not far from the diamond mines are the richest gold mines in the world. These are in the Transvaal, a country of from 110,000 to 120,000 square miles, 240 miles from north to south and 360 miles from east to west, and with a population of 700,000 to 750,000. Of these 75,000 are Boers.*

The ancestors of the Boers were Dutch and French Huguenots, who had with our own Pilgrim Fathers found in Holland a refuge from persecution for more than a generation. They left Holland about the same time that the Pilgrims and Dutch sailed for America—the one to an inhospitable climate and a

* Boer is the same word as the German Bauer and English boor, a peasant farmer.

life of hardship, privation, and intense activity, the other to a genial climate, where toil was unnecessary and where all the surroundings were favorable to life and a rapid increase of population. The one has steadily advanced, the other retrograded, a difference largely due to environment.

The southern coast of Africa for nearly eight hundred miles, is entirely destitute of navigable rivers; has neither harbors nor islands, has only one or two open roadsteads, and therefore offers no inducements to commerce. Nearly parallel with the coastline are three chains of mountains running from east to west, the first about fifty miles from the ocean and the others from fifty to one hundred miles apart, each succeeding range rising higher than the one in front of it. On the coast the soil is rich and fertile, producing excellent grapes, yielding more wine per acre than those of any other country, though of an inferior quality. There is an abundant rainfall and the crops are large, but the rain clouds passing over the mountains leave the plateau between them dry and barren. North of the third range is the valley of the Orange, various branches of which, rising to the north and south among the mountains, flow across Africa to the Atlantic. Its eastern watershed is well watered and can be easily irrigated, but until irrigated it is only adapted to grazing.

The railroad from the cape of Good Hope to Johannesburg runs almost through the middle of the country. The land west of the railroad is arid, and the Orange river grows shallower as it approaches the sea. Only a small portion of the country is suitable for agriculture, but a large part offers, with but little labor, good pasturage for cattle all the year round. The climate is delightful, the thermometer rarely rising to 90° Fah. or falling below the freezing point.

This country was formerly inhabited by the Hottentots, among the lowest in the scale of negro races. About the time the Boers landed in South Africa, the Bantus, the highest in the scale, were pushing their way to the south, along the eastern coast, forcing the Hottentots into the interior and thence to the west. After the advent of the Boers the increase in population was very slow, the total number of inhabitants being only about twenty thousand when the English took possession of Cape Colony in 1800. The English emigrants were better educated than the Boers, and the two races have rarely intermarried.

After the Crimean war in 1855, 2,000 to 3,000 Germans, volunteers in that war, were given homesteads in southeastern Africa

by the English; these have in the main been absorbed by the Boers.

Between 1820 and 1830 slavery was abolished by Great Britain. The Dutch, who were engaged in trade and agriculture, freed their slaves and remained in Cape Colony, mingling more and more with the English; those engaged in the raising of cattle, dissatisfied with the compensation offered, moved northward, though still under British dominion.

The English and the Boers were engaged in continual conflict with the natives, but the home government was unwilling to defend the settlers. The Boers were therefore compelled to defend themselves, and thereby gradually became independent, roaming with their families and cattle, crushing out or enslaving the natives, until they reached the Orange river, in the country now called the Orange Free State. Between 1835 and 1838 they settled beyond the river Vaal, in the Transvaal. Here scattered over a vast area each family occupies as many acres as it desires. There is no means of intercommunication, save by ox wagons, traveling only twelve miles a day. The people are without near neighbors, and there are very few towns or villages. In such a community education is necessarily neglected. Intermingling with English, Germans, and Kaffirs they speak a dialect unlike either the pure Dutch or the Dutch spoken in Cape Town. They live in perfect social equality, with a strong sense of personal dignity—proud, independent, neither rich nor poor, but shrewd and self-willed. Mr Gladstone has described them as "Protestants in religion, Hollanders in origin, vigorous, obstinate, and tenacious in character, even as we are."

In time of drought they move with their families and cattle from place to place for pasturage, returning after the rains to their homes. The hunting of game is an absolute necessity, not only for the protection of the cattle from wild animals, but for food, clothing, and trade. In consequence, the elephant, lion, rhinoceros, ostrich, and zebra have been almost entirely driven to the north. When they are gone the Boer will probably lose his remarkable skill with the rifle.

When the Boers receive a summons to arms from the president they take their provisions, rifles, and ammunition, mount their horses, and are off, the best sharpshooters and guerillas in the world, as the English have frequently learned to their cost, especially in the battle of Majuba hill, where, though strongly entrenched, they were defeated with great loss.

THE NORRIS PETERS CO. PHOTO-LITHO. WASHINGTON, D. C.

XUM

When the Boers were in Cape Colony, and for some time afterward during their nomad life, they were under English rule. They rebelled at times, but it was not until 1852 that they threw off the English yoke and became a free people. In 1882 Paul Kruger was elected president, and by the Convention of London in 1884 the Transvaal was recognized as a nation, England merely retaining the right to approve "all treaties made with any state or nation other than the Orange Free State, and with any native tribes outside the Transvaal." The Boers agreed that "all persons, with their families, should have full liberty to reside in any part of the Transvaal and to carrry on any kind of business, and such persons were to be subject to no higher taxation than is or may be imposed upon citizens;" also that no slavery was to be tolerated. If these privileges are conceded, England has no right to interfere in its internal affairs.

The government of the Transvaal is nominally administered by a parliament, but the power is in the hands of Paul Kruger, the president, the grandson of a German, a stolid Boer of great natural ability and shrewdness, with strong homely features and blue eyes showing keen watchfulness and great firmness of purpose. When parliament is not in session, he has power to issue proclamations, which can be enforced until its next meeting, and when it is in session he rules the members, it is said, by threatening to reduce their salaries.

In 1885 gold was discovered on a ridge about six thousand feet above sea-level, near the present city of Johannesburg. Immigrants immediately flocked in. Today Johannesburg is the center of a district, according to an informal but reliable census, of 120,850 Europeans and Americans, all of whom are engaged in mining. This discovery of gold has been most fortunate for the world. As the production of the mines of California fell off, the loss has been made up in the Transvaal. After the discovery of the California mines, the gold production of the world gradually increased until 1853, when it reached the maximum of $155,000,000; then it steadily diminished until 1883, when it was only $95,000,000; at this time the African mines began to supply the market. Since then production has rapidly increased, and it is believed that in 1896 it will be over $200,000,000, the largest amount ever mined, and one-half will come from the Transvaal. The veins have been carefully surveyed and traced for several hundred miles, and it is believed that they are more extensive than any other gold fields. In many places the re-

mains of ancient surface workings, probably hundreds of years old, have been found, supposed by some to be the mines of King Solomon.

Beside the gold mines, the Transvaal is rich in all kinds of minerals, especially silver, copper, coal, and iron. The soil also is very rich, and with a proper system of irrigation is capable of yielding large returns; but the farms of the Boers are neglected and unproductive. The late Lord Randolph Churchill, who visited it in 1892, wrote of it that "it might be the most wealthy and prosperous spot on earth, but Providence has cursed it with the rule of fifty thousand Boers."

The foreigners, or Uitlanders, as they are called, desire representation in the government and claim rights and privileges to which as foreigners and unnaturalized citizens they are not entitled. They assert that taxes in Johannesburg, contrary to the convention of 1884, are ten times as high as in Pretoria, and that nine-tenths of all the taxes are paid by them; that they have no right to vote or to participate in the administration of the general or local governments; that they are compelled to sustain schools where all the instruction is in the Dutch language. In answer it is said that Pretoria is a town of poor farms; Johannesburg a bustling, growing, thriving mining city, with a large, unruly population, where taxes must be high; that the foreigners are absorbing the trade and carrying away the wealth of the country, and should therefore pay the larger part of the taxes; that the laws give the Uitlanders the right to vote after naturalization and to become members of the lower, though not of the higher, house; that the schools were established by the Boers for their own children, not for the English, and that naturally no provision has been made for instruction in a foreign language; that the Uitlanders came into the Transvaal a short time ago without invitation from the Boers, without any fixed determination to remain, solely for their own profit, and have therefore no right to complain of laws to which they have voluntarily submitted.

The Uitlanders looked to Mr Cecil Rhodes and his company for help and gladly promised to join any force that might be sent to their relief. In response to this appeal Dr Jameson collected the police force of the chartered company, crossed the boundary into the Transvaal in the last days of 1895 to restore the Transvaal to English rule; but he had underestimated the strategical skill, the strength, and ability of the Boers. General Joubert,

the commander, showed on this, as on prior occasions, great military ability, and by his quick movements put down the incipient rebellion at Johannesburg, and defeated and captured the English forces. All South Africa would have rejoiced in the success of Dr Jameson, and England would have accepted the situation. Germany might have objected, though we cannot see what right she would have had, for the Transvaal is hundreds of miles from her possessions, and the new doctrine of "Sphere of Influence" could not have applied.

The Boers have shown great forbearance, wisdom, and good judgment in this emergency. In time of peace armed men invaded their country to overthrow the government. They could justly have been hanged, but, at the request of the British government, the president surrendered Dr Jameson and his men for trial according to the laws of Great Britain. We doubt if it would be easy to find in all history an instance of like forbearance and mercy. It should, however, be remembered that the fathers of the present Boers either drove the natives from the Transvaal or reduced them to slavery, the higher civilization driving out the lower.

This country, with its delightful climate, fertile soil, forests of valuable timber, mines of precious metals, and large deposits of coal, will continue to draw large numbers of emigrants from England. Further disturbance is therefore sure to arise unless the Boers give the Uitlanders the civil rights they claim, and these once secured, it is inevitable that the British flag will float over the Transvaal.

Other gold veins are worked in various places on the territory of the chartered company. Buluwayo, in November, 1893, the chief kraal of Lobengula, has now a population of 4,000, and is the center of one of the gold fields. None of these fields has thus far proved profitable, but there is every reason to believe that gold will be found in great abundance.

There are political movements which politicians do not initiate; revolutions accomplished without statesmen or captains. In these we look in vain for a master-mind, acting either alone or with others. Not the least significant are the changes effected by the discovery of gold. The middle of the century witnessed a wonderful development in the United States and Australia; its close promises to witness an even greater revolution in South Africa.

ABYSSINIA

We will now turn from the Transvaal to Abyssinia and the Italian possessions on the Red sea, where Italy is engaged in what may prove to be a life-and-death struggle.

Abyssinia, or Ethiopia, as it was formerly called, is the most elevated plateau of Africa. The coast of the Red sea is here low, dry, and utterly devoid of vegetation, consisting of great sand wastes, only relieved by alkali plains, salt marshes and salt lakes, hot, and most unhealthy. A traveler, writing of this region, says: "The country is a parched, desolate region; the climate an intensified, perpetual, torrid heat; the rainfall one or more terrific thunder-storms in the year; the occupation of the inhabitants tending scanty and wretched flocks and herds, watching the approach of enemies; their fears always alive for sudden death; their hopes for peace."

The ground rises abruptly to the height of nine or ten thousand feet, forming a steep mountain chain about six hundred miles long, at first parallel to the Red sea, but near Massowah the coast trends to the southeast, while the range continues its southerly course. Some of these mountains rise to the height of sixteen thousand feet. Far away on the west the country falls gradually to the Nile valley, and on the southwest to the great lakes. The only access to this plateau from the Red sea is up great gorges or canyons 1,000 to 3,000 feet in depth, each canyon varying in width from two or three feet to one hundred feet, with sudden turns shutting off the view beyond. Down these canyons in the wet season the water rushes with great violence, bringing masses of stone and rock; but the greater part of the year they are dry, and the traveler must often go from twenty to thirty miles without finding water. This plateau when reached is not a level plain, but is broken and tossed up by volcanic action, the mountains assuming wild fantastic forms, with abrupt, precipitous valleys, only accessible through deep passes. The plateaus, between six thousand and eight thousand feet above sea-level, are the temperate region, never either very hot or very cold. Some of the canyons are so deep that one can stand on the edge and, looking down, see at one glance the vegetation of the frigid, temperate, and torrid zones. The rivers flowing through these canyons act as barriers to communication, instead of facilitating it. In this region the Blue Nile rises and flows through deep canyons, falling about

4,000 feet in less than three hundred miles and cutting Abyssinia into Northern and Southern Ethiopia. The volume of this river is increased from 6,000 cubic feet per second in the dry season to 220,000 in the rainy season, and it carries down the earth from these high lands to Egypt, which owes its prodigious fertility to the Blue Nile.

From its elevation Abyssinia is healthy; and the climate is said to be as salubrious as any on the globe. The valleys on the western slope are fertile, producing abundant fruits and the vegetation of the temperate and tropical zones. Its lofty ranges are the home of Abyssinians, Copts, Arabs, and Jews of the Caucasian race—partially civilized tribes, once converted to Christianity, and still calling themselves Christians. The people are strong and active, but rude and barbarous. The different tribes are generally at war with each other, but at present they are all united under one ruler, who claims descent from the Queen of Sheba.

During the ages many attempts have been made to conquer the Abyssinians, but this has always been most difficult, as they can only be reached either from Egypt up the valley of the Nile or from the Red sea through one of the canyons. The latter has been the route most usually attempted, with results generally disastrous to the invader. The Abyssinians, hidden in the clefts of the mountains, behind the rocks and bushes, wait until the enemy has reached a difficult part of the canyon before attacking him. The most notable exception was in 1868, when the British, under Sir R. Napier, marched through one of these canyons, captured Magdala, and took prisoner King Theodore; but at that time Theodore had by his atrocities alienated the other chiefs and tribes, and through their aid the British passed up the canyon without opposition. It was in one of these canyons that the Abyssinians, under Menelek, the Negus Negus or King of Kings, as their emperor is called, lying in ambush, recently surprised and completely routed the Italians. It is said that the Abyssinian army of one hundred thousand men was supplied with the best repeating rifles by the French and Russians, and was aided by French officers.

The Russians have recently sent an embassy to Abyssinia and received an ambassador from that country, and negotiations are in progress to bring the Abyssinians into the Greek church.

About twenty years ago the Egyptians occupied the whole of

the upper Nile, even to the Great Lakes and the valley of the Red sea. Abyssinia lay between these possessions, and the Khedive desired to conquer it. He sent two large armies, which marched up the eastern branches of the Nile to Abyssinia; both armies were defeated. The son of the Khedive, in command of the second army, was captured with a large number of men, but was subsequently ransomed.

A Mohammedan, born in Dongola, calling himself El Mahdi—*i. e.*, the leader, prophet, or guide—appeared in the Sudan about 1880, and raised the flag of the Prophet on a small island in the Nile near Khartum. Soon Arabs from the desert joined him, and later the Bedouins flocked from all parts of Egypt. About the same time Arabi Pasha, then an officer in the Egyptian army, conspired with El Mahdi and seized Cairo, the Khedive and English retiring to Alexandria. Sir Garnet Wolseley was sent to command the English and Indian armies, and at the battle of Tel-el-Kebir, September, 1882, Arabi was defeated and taken prisoner. He was subsequently sent to Ceylon, but the disaffection in the upper Nile continued to extend, and soon the whole population of the Sudan and upper Nile was gathered under the banner of the prophet El Mahdi. He defeated four expeditions, and in 1883 General Hicks Pasha, with an Anglo-Egyptian army of 10,000, was sent against him. They marched into the desert, and for months nothing was heard of the expedition, then slowly the news of its annihilation reached Cairo. In June El Mahdi captured Khartum, killing General Gordon a few days before General Wolseley with the English army came in sight of the city—too late. They returned without even attempting to avenge his death.

El Mahdi died a few months later, but his army was not dispersed. Osman Digna, the general of the Mahdists, overran the region east of the Nile, capturing and massacring Egyptian garrisons at different places and marching to the very gates of Suakin on the Red Sea, where the Mahdists desired to have a seaport for communication with Arabia, in order to obtain a good market for slaves from the interior of Africa. With these Mahdists the Italians have now to contend. Soon after their occupation of Massowah they acquired control of Tigre and Kassala, then held by the Mahdists and Dervishes. These fanatics, encouraged by the defeat of the Italians, are now said to be preparing to attack Kassala.

The English, for the purpose of aiding the Italians and re-

covering the valley of the upper Nile, wrested from Egypt by the Mahdists ten years ago, have sent a body of English troops, with an army of Sudanese and Egyptians, under English officers, from Cairo up the Nile to Dongola, between the fourth and fifth cataracts, in the expectation that the Mahdists and Dervishes will be drawn from Kassala to attack the English. If the latter are successful they will probably march up the valley to Khartum. If they are unsuccessful it is feared that the Mahdists will march down the valley to Cairo.

To an American it seems difficult to understand the reason that led Italy to attempt the acquisition of such a territory in Africa, and why Signor Crispi, under whose ministry it was undertaken, should assert that "colonial extension is a vital question—the advantage which it brings not being translatable into figures."

Unfortunately for Signor Crispi it has been translated into figures which show a large and serious deficit in Italian finances.

THE PHYSICAL FEATURES OF AFRICA AS THEY AFFECT ITS ECONOMIC VALUE, FUTURE OCCUPATION, AND CIVILIZATION.

The growth and prosperity of a country depend on its formation, including its mountains, temperature, and rainfall, its mineral and vegetable productions, and its facilities for intercommunication.

Africa is unlike the other continents, especially in the uniformity of its topography and in its temperature. It is a great peninsula, without islands, indentations, or harbors on its coast. This difference is especially exemplified by the Mediterranean coasts of Africa and Europe. The former is a long continued sand beach, without a break and with only one or two good harbors, while on the European side are the great peninsulas of Spain, Italy, and Greece, everywhere indented with island-studded seas and with bays and harbors.

Africa has a coastline of only 15,000 miles. If it was as long as that of Europe, in proportion to the size of the continent, it would be 57,000 miles long.

The relief of the land, instead of being centered in long and lofty mountain ranges, has been spread over the continent with wonderful equality, forming high plateaus, with terraces to the ocean, down which the water rushes in rapids or over high falls, which render the great rivers impossible of navigation. Notwith-

standing this lack of long mountain ranges, its average altitude—about 2,000 feet—is higher than that of the other continents.

The country north of the equator presents a great similarity to the country south of it, though the features on the north are on a much larger scale. North of the equator is the greater lake Chad, south of it the smaller lake Ngami; north of lake Chad is the great desert of Sahara; south of lake Ngami is the small desert of Kalahari. North of Sahara, on the Mediterranean, and south of Kalahari, on the Indian ocean, are fertile tracts of limited extent, where the rainfall is abundant and vegetation flourishes.

The greater part of the territory between the Mediterranean and Sudan and between the Atlantic and the Red sea, and a considerable portion south of the Zambesi, comprising nearly one-half of Africa, is practically Sahara—that is, a waste or desert.

The Sahara is a plateau of diversified structure, with hills and numerous dried-up water-courses; regions of dunes or steppes, overgrown with alfa, alternating with sandy waste. At sunset the temperature falls quickly, causing a difference of one hundred degrees between day and night. Scattered through the desert are about four hundred oases, where the date palm flourishes. In many places wells have been dug, and great caravans follow the line of these oases and wells. The desert of Kalahari, in South Africa, is much smaller, has a more temperate climate, resembles our arid lands, and, like the latter region, is to a large extent suitable for the pasturing of cattle.

Although Africa is about five thousand miles long and four thousand five hundred miles wide in the broadest part, stretching over seventy degrees of latitude, about two-thirds of its area lies within the tropics, with a vertical sun twice a year, giving it the hottest climate in the world. The average temperature is eighty degrees, while north and south of the tropics the average temperature is only ten degrees less. In the tropics the climate is so enervating and unhealthy for Europeans that they cannot live there more than two or three years, while the same climate is most favorable to the negro.

The Germans occupied the Kamerun, in western Africa, near the equator, supposing that a great mountain rising fourteen thousand feet directly from the ocean would prove an excellent health resort; but the miasmatic vapors ascend the mountain slopes and render it an unfit habitation for the European. The rainfall in equatorial Africa is most abundant, from seventy to

one hundred inches a year, causing a hot, moist atmosphere and a luxuriant vegetation. In this region the population is densest, from the abundance of fruits and the ease with which life is supported. There is also a heavy rainfall in the mountains of Abyssinia, on the northwest coast of the Mediterranean and on the southern and southeastern coasts, the rainfall diminishing toward the central and western parts of South Africa. As the rainfall diminishes, the native population decreases. All the other continents have great rivers, forming waterways to and from the interior. Africa has but one such river—the Niger. The Nile and Kongo are, however, among the most remarkable rivers in the world; the Nile, for its history and inundations; the Kongo, for the great number of its branches, navigable for small vessels for several thousand miles. On this river and its branches there are from forty to fifty stern-wheel steamers and about 100 stations, with from 600 to 800 white men in charge.

The whole trade of Africa, excepting that of Cape Colony and the Mediterranean, is monopolized by great companies, and where these do not exist, by smaller traders. This trade is most profitable to Europeans, consisting largely in the exchange of cheap cotton goods, beads, copper wire, in limited quantities, and of rum, brandy, old arms, and ammunition, in large quantities, for ivory, india-rubber, and other products.

The total amount of the annual exports and imports of Africa other than from the Mediterranean and exclusive of gold, silver, and diamonds is, however, scarcely equal to the annual foreign trade of one of the large ports of the United States.

From this résumé it appears that Africa produces abundantly in the equatorial provinces, where the white man cannot live; that there are not any good waterways from the interior to the coast and few good harbors when it is reached; that the only articles obtained from the natives are elephants' tusks and the fruits that grow spontaneously; that the only way of moving products to and from the sea is by caravans, a slow and expensive method, precluding any extensive commerce. From this it follows that the value of equatorial Africa is and must be for a long time very small It is possible to build railroads into the interior of equatorial Africa, for one or two are now in operation in Portuguese West Africa, one is in process of construction around the falls of the Kongo, and surveys are being made in eastern Africa, both by England and by Germany, and in northwestern Africa by France; but it is doubtful if there is now suf-

ficient business to enable these roads to pay operating expenses, nor can the trade be materially increased until the natives acquire the habits and wants of civilized life and are willing to labor and raise the products that will grow in the tropics and exchange them for the goods and wares of Europe and America. This change is slowly taking place. The mercantile agencies must and do employ native traders and native labor. All the work in the tropics is performed by Africans; men whose fathers never saw or heard of white men are building railroads and telegraphs and carrying great loads from the interior to the coast; some are in superior positions, in charge of stores and telegraph-offices or steamboats; some receive regular wages; others are paid in clothing or spirits.

The European can probably live in the high plateaus of Abyssinia, in the Lake region, and in southern Africa, where, from the elevation, he would have a European or temperate climate. Southeastern and central South Africa have a temperate climate, are generally well watered, and the land is capable of cultivation by irrigation. In this region the mineral wealth is large, and it is connected with the Indian ocean and South Atlantic by railroads now in operation. There seems to be no physical cause to prevent these regions from becoming the homes of numbers of Europeans beside the present occupants.

In America the Indians or natives have invariably given place to the white man and have been generally exterminated. Will the negroes or natives of Africa retire before the European? Let us consider South Africa the portion of the continent most favorable to the white man. The slave trade and the constant wars between the natives have been stopped; the Kaffirs have exchanged the brutal rule of the savage for the beneficent government of the European, and have become freemen, endowed with an absolute title to their homes and to any property they may acquire. They cultivate the fields of the Boer; they work in the diamond and gold mines; they own large herds of cattle, and, compelled to give up their nomad life, they have commenced tilling the ground for themselves.

Instead of white day laborers, as in Europe and America, the English in South Africa employ the Kaffir. As a result the native population is increasing with accelerated rapidity. It is already many times more numerous than the European and the disparity is constantly and rapidly increasing. The Kaffir lives more cheaply and works for less wages than the white man. The only

Europeans required, or for whom there is room or occupation, are the owner and the overseer, the mechanic and the engineer. In another generation the Kaffir will fill most of these places, and there will be no work or position in the interior for the Englishman. The capitalist, the manufacturer, the merchant, and the trader will live in the cities.

First the Hottentots were expelled by the Bantus; then the Bantus were driven into the interior by the Boers; the Boer in his turn gives way to the Englishman only to be ejected by the Kaffir when he has learned to work.

What is true of the Kaffir holds good to a less extent of the Bantus and negro tribes in Equatorial Africa. The Arab slave dealer has been shorn of his power; the slave trade has been generally stopped, and with that the prime cause of the internecine wars. Wherever the European rule is established and peace assured, improvement soon appears in the habits and character of the people, with a very rapid increase of the population.

The Arab, Bantu, and negro must occupy the equatorial regions of Africa, because the white man cannot live there, and they will then, I believe, drive out the Europeans from the remainder of the continent and we shall see a race vastly superior to any Africans now there and in some respects superior to the white man.

FUNDAMENTAL GEOGRAPHIC RELATION OF THE THREE AMERICAS

By Robert T. Hill,

United States Geological Survey

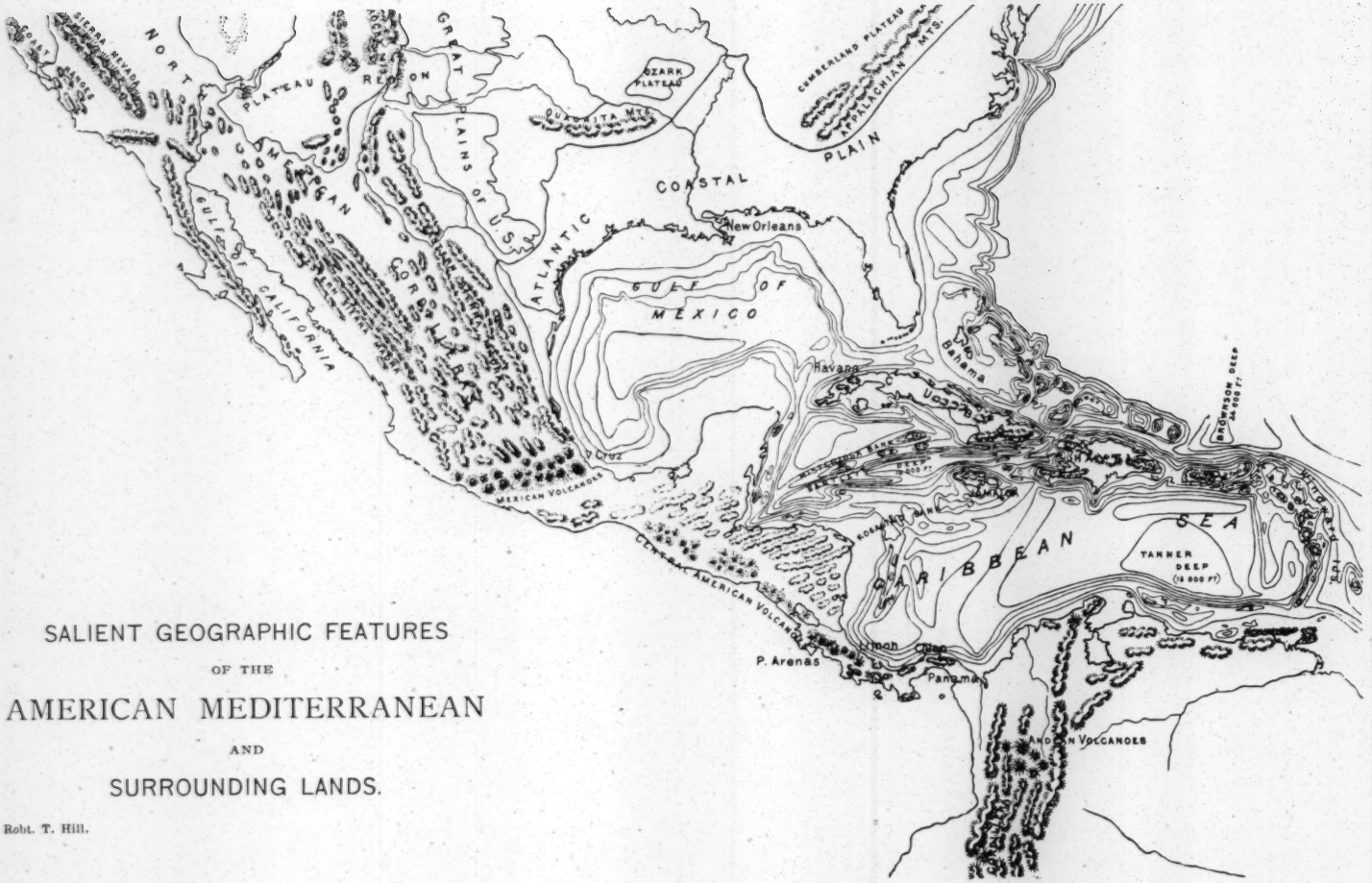
The early geographers taught that the two American continents are practically dominated by a continuous cordilleran system, running like a backbone through South America, Central America, and North America, connecting the whole western border of the hemisphere into one great mountain system. Modern exploration shows that this teaching must be modified.

The Andean cordilleran belt dominating the western coast of South America trifurcates after crossing the equator, bends slightly eastward, and abruptly terminates in northern Colombia. Only one doubtful spur of the Andes touches the coast of the American Mediterranean, and this is the Sierra del Marta,

lying between the gulf of Maracaibo and Rio Magdalena. This northern end of the Andes lies entirely west of the Isthmian region and is separated from it by Rio Atrato. Minute study shows that the Andean system has no genetic connection with the mountains of the northern coast of South America, much less with the mountains of Central America or the great Rocky Mountain region of Mexico and the United States; in fact, the deeply eroded valley of this stream nearly severs the Isthmian region and the Pacific coast of the Republic of Colombia from the South American continent.

The studies of many geographers, especially those recently conducted by Felix and Lenk, have shown that the main cordilleran system of Mexico, which is the southern continuation of the Rocky Mountain region of the United States, abruptly terminates with the great scarp or "abfall" of the so-called plateau a little south of the capital of the Republic, and that these mountains have no orographic features in common with those of the Central American region lying further southward. The axes of the two great North American and South American cordilleras, the Rocky mountains and the Andean system, if projected from their termini in Colombia and southern Mexico, respectively, would not connect through Central America, but would pass each other in parallel lines many hundred miles apart. The projected Andes would pass through Jamaica and eastern Cuba and continue east of the longitude of the whole Appalachian system in the direction of Nova Scotia; the southward continuation of the North American cordilleras would cross the equator in the Pacific, far west of Central America and the South American continent.

Between the widely separated termini of the main North American and South American cordilleras as above defined, and extending directly across their trend at right angles to them, lies another great orogenic system of folds, to which the term Antillean has been applied. Collectively they constitute a great orogenic system which has been of the utmost importance in giving to the Caribbean region its predominant outlines—a system composed of corrugations having an east-west trend, which has never been appreciated by the geologist or geographer owing to the overwhelming proportions of the adjacent mountains built up by volcanic ejecta. They extend along the Venezuelan and Colombian coast of South America, north of the Orinoco, the isthmus of Panama, Costa Rica, and the eastern



SALIENT GEOGRAPHIC FEATURES

OF THE

AMERICAN MEDITERRANEAN

AND

SURROUNDING LANDS.

Robt. T. Hill.

parts of Nicaragua, Guatemala, Honduras, Yucatan, Chiapas, and southern Oaxaca, and through the Great Antilles. These mountains are made up of granites, eruptives, and folded sedimentary rocks of Paleozoic, Mesozoic, and Cenozoic age in Guatemala and southern Mexico; of Mesozoic and Cenozoic age in the Antilles, Costa Rica, Venezuela, and Colombia; and of Cenozoic age in Panama.

The two elongated submarine ridges (the so-called Misterosa and Rosalind banks) stretching across the Caribbean from the Antilles to the Central American coast, between the Sierra Maestro of Cuba and the gulf of Honduras, and from Jamaica to cape Gracios a Dios respectively, separated by the submarine valley, 18,000 feet in depth, known as "Bartlett Deep," have a suggestive and remarkable resemblance to these east-west corrugations of the land; indeed Seebach long since suggested that these ridges directly connected the mountains of the Antilles with those of Guatemala and Honduras.

Thus the Caribbean sea is almost entirely surrounded by the east-west trending mountains and submarine ridges of the Antillean type; the Windward islands, marking the eastern inlet of the sea, are largely volcanic necks.

A distinct class of mountains, independent of great lines of folding of the earth-crust, are the volcanoes. These have grown by extrusion and accumulation; sometimes they are parasitic on the folded mother-systems, sometimes independent of them. They belong to the great area of igneous activity which, since at least as early as the beginning of Tertiary time, has marked the whole western half of the North American continent, the Caribbean, and the northern and western sides of the Andean region. Although they blend, the volcanic ejecta of this great belt may be classified for convenience in two distinct age categories, which may be called the quiescent and the active volcanic groups.

The active volcanic groups occur in four widely separated regions: 1. The Andean group of volcanoes of the equatorial region of western South America, rising above the corrugated folds of the northern termination of the predominant South American cordilleras. 2. The chain of some twenty-five great cinder cones which stretch east and west across the southern end of the Mexican plateau, protruding parasite-like upon the terminus of the North American cordilleras. 3. The Central American group, with its thirty-one active craters, growing diagonally across the western ends of the east-west folds of the Antil-

lean corrugations, which fringes the Pacific side of Guatemala, San Salvador, and Costa Rica; this is separated from the Mexican group on the north by a large non-volcanic area (the isthmus of Tehuantepec), and from the Andean volcanoes on the south by an area (the isthmus of Panama) in which no living volcanoes are found. 4. The chain of volcanoes of the Windward islands, marking the eastern gate of the Caribbean sea and standing in a line directly across the eastern termini of the Antillean mountains of east-west trend, parallel to the Central American group similarly situated at the western termini of these mountains. In recent times all these giants of fire have built up vast piles of lava and cinder into lofty summits, which overwhelm in topographic grandeur the lesser but more significant orographic features of the region.

The quiescent volcanic regions, where activity was dominant chiefly in Tertiary time, but ceased long ago, are many. The isthmus of Panama, the Pacific coast of South America west of the Atrato, the northern coast of South America, and the old volcanic regions of northern Mexico and the United States are among these. There can be little doubt that the tremendous outbursts of igneous material in Tertiary time, which dominated western North America, extended in a great belt around the southern end of the North American cordilleras, crossing the Caribbean area to the Atlantic between the two continents.

The North American cordilleran region lying north of the isthmus of Tehuantepec is one of north-south folded sedimentaries, plus accumulations of volcanic intrusions and ejecta (chiefly Tertiary), and dominates a continental area.

The Andean region of the South American continent is one of north-south folded sedimentaries, plus accumulations of Tertiary volcanic intrusions and ejecta, and dominates a continental area.

The Caribbean region, including Central America, the Antilles and the Windward islands, and most of the Venezuelan and Colombian coast of South America, is one of east-west folded sedimentaries, plus accumulations of volcanic intrusions and ejecta, but, instead of dominating a continental region, *practically constitutes a mountainous perimeter surrounding the depressed basin of the Caribbean.* These mountains were mostly made about the close of Tertiary time, and hence are newer than the chief continental systems.

Upon this arrangement of the three systems of mountain folds are chiefly dependent the great physical differences between

the lands bordering the gulf of Mexico and Caribbean sea; the former in its geognostic aspects and relations is North American, while the latter is distinctly Central American.

The gulf of Mexico, with the single exception of its extreme southwestern indentation of the coast of Mexico, is surrounded by gently tilted plains, composed of great sheets of subhorizontal sediment, largely deposited by its own waters when they occupied a larger area than at present.

The Central American region as above outlined—*i. e.*, that portion of the American hemisphere extending from the southern termination of the Rocky Mountain region to the northern termination of the South American Andes, including the southern border of Mexico, the Republics of Central America, and the isthmus of Panama proper—constitutes the western perimeter of the circle of mountains inclosing the Caribbean. As a whole it is called by some writers the American Isthmian region,* and can be genetically separated into two conspicuous regions: 1. The recent volcanic plateau lying nearer the Pacific coast from its commencement in Guatemala to its eastern termination in Costa Rica, which is composed of accumulated material extruded across the western termini of the Antillean trends. 2. The lower but nevertheless mountainous portions of the Caribbean side, composed of folded mountain-axes extending east-west in conformable direction with the Antillean uplifts, accompanied by old eruptive extrusions of past geologic time. The most conspicuous eminences are the grand volcanic peaks of Guatemala, San Salvador, and Costa Rica. These rise to an average height of 10,000 feet, in irregular masses standing nearer the Pacific coast than the Atlantic until reaching the borders of Costa Rica, when they sweep diagonally toward the Caribbean side, again assuming in the southern portion of that republic a central continental position. These great eminences are built up of accumulations of volcanic debris, which have buried and largely concealed a most interesting antecedent geologic structure that must be interpreted before the complete history of the region can be written. These mountains, being largely extrusions of volcanic material instead of regular folds or plications of stratified rock, produce irregularities of surface which defy the ordinary modes of classification.

* The conspicuous features of this greater Isthmian (Central American) region are its narrow, elongated outlines relative to the broadening areas of the adjacent continent and the completely mountainous character of its entire area, which is void of coastal plains.

The western termini of the east-west Antillean axes of the Caribbean half of Central America, which are buried in western Guatemala, Honduras, and Costa Rica by the overlying volcanic masses, are not so limited on the Pacific side, but continue across Panama. On entering this state from Costa Rica signs of recent volcanic activity cease, and the continuity of the chain of high Central American summits is succeeded by the still more broken and apparently inexplicable lower-lying Isthmian topography.

The isthmus of Panama can now be accurately defined as the stretch of land lying east of the southern end of the Central American region of active volcanoes (commonly called the Costa Rican volcanic plateau) and extending to the northern termination of the Andes. Its limit on the east is Rio Atrato, which flows northward from the equator along the valley marking the eastern flank of the Andes; on the west it is limited by the southern boundary of the republic of Costa Rica, extending from Burica Point to the island of Veraguas and thence between the meridians of 79° 15′ and 82° for a distance of 180 miles. The axial trend of the Isthmian region is east and west, or in a direction contrary to the north and south continental trends, and is conformable with the Antillean axes.

The Great Antilles lie along the line of east-west corrugations and apparently represent nodes of greater elevation whereby the surfaces of these islands were projected above the waters as islands, which have persisted without continental connection or union with each other since their origin.

[Note.—The foregoing article is published by permission of Professor Agassiz, under whose auspices the writer conducted his investigations in the region described.]

THE KANSAS RIVER

By Arthur P. Davis

United States Geological Survey

The Kansas river proper is formed by the junction of the Smoky Hill and Republican forks, at Fort Riley, in Davis county, Kansas, about 140 miles from where it empties into the Missouri. It is one of the best examples of a western stream whose drainage lies entirely in a plains region, with no mountain tributaries. Its basin extends from eastern Colorado to the Missouri

river, a distance of 485 miles, with an extreme width of nearly 200 miles. The total area drained, as measured from the latest drainage maps of the General Land Office, is 61,440 square miles, of which 34,526 are in Kansas, 17,454 in Nebraska, and 9,459 in Colorado.

The altitude of the basin varies from 750 feet at Kansas City to over 5,000 feet in Colorado, the average being about 2,500 feet. The area is distributed with reference to elevation as follows:

Under 1,000 feet	1,250	square miles.
Between 1,000 and 2,000 feet	26,200	" "
" 2,000 and 3,000 feet	14,300	" "
" 3,000 and 4,000 feet	12,560	" "
" 4,000 and 5,000 feet	5,620	" "
Over 5,000 feet	1,510	" "

Gauge readings have been carried on for several years at the mill dam at Lawrence by the mill owner. Sufficient measurements have not yet been made to establish a mean annual flow. The minimum discharge is probably a little over 500 second-feet. The mean annual rainfall of this basin varies with approximate regularity from about ten inches at its western extremity to nearly forty inches at the Missouri river, averaging perhaps twenty inches. It will be seen, therefore, that this basin reverses the conditions of the typical western stream which rises in the mountains, where the precipitation is great, and carries its abundant waters into the arid plains, where the smaller tributaries can be used one by one, as they leave the mountains, to irrigate the plain.

Rising as they do, in the most arid portion of the basin, and draining a sandy country of gentle slope, the streams, except at the rainiest times, are almost insignificant in size until they reach the region where the precipitation is sufficient for the requirements of agriculture. They thus attain a considerable volume only in the eastern part of the State, where irrigation is not imperative, and where, moreover, nearly all the water is concentrated in one stream so large and with so gentle a slope that its diversion for commercial purposes is impracticable. If the rainfall conditions of the Kansas basin could be reversed, with a forty-inch precipitation in eastern Colorado, decreasing to one of ten inches at the Missouri, its irrigation possibilities would be increased many fold.

Three principal rivers flow directly into the Kansas: the Blue, from the north; the Republican, from the northwest, and the Smoky Hill, from the west. The Blue has a drainage of 9,490

square miles, of which 2,450 are in Kansas and 7,040 in Nebraska. In volume of water the Blue river is by far the most important of the tributaries of the Kansas. The discharge of this river is being measured by the Geological Survey at Rockyford, about five miles above its mouth, and the minimum has been found to be about 300 cubic feet per second.

The next stream in order, and also in amount of water delivered, is the Republican, draining an area of 25,837 square miles, and showing a minimum flow, as observed at Junction City, of about 200 cubic feet per second. It will be noticed that though draining over two and one-half times as large an area as the Blue, its discharge at low water is only two-thirds as great as that of the latter stream. This is due to the fact that the Blue drains the northern and eastern parts of the basin, where the rainfall is heaviest, while the Republican rises at the western extremity of the drainage area and flows for hundreds of miles through arid sand hills that yield very little run-off, except in times of excessive rainfall. No part of its basin receives a precipitation equal to the average of the basin of the Blue; so, although the basins adjoin each other and the rivers empty within twenty miles of each other, the ratio of run-off to area is over four times as great for the Blue as for the Republican.

The Smoky Hill river rises in eastern Colorado and drains an area of 20,428 square miles. It has two considerable tributaries, the Saline and the Solomon, draining respectively 3,311 and 6,882 square miles. Gauging stations have been established on all three of these streams. The station at Ellsworth, on the Smoky Hill, intercepts the drainage of 7,980 square miles, of which 6,447 are in Kansas and 1,533 in Colorado. A minimum discharge of only 10 cubic feet per second sometimes occurs at this point. At the gauge on the Saline river at Beverly the area drained is 2,730 square miles, and a low-water discharge of 20 second-feet is shown. The gauge on the Solomon is at Beloit. The area draining past this point is 5,539 square miles, and the low-water flow is 140 cubic feet per second.

There are many water-power developments in the Kansas basin, the most numerous and important occurring on the Solomon and Blue rivers. These developments are, however, in their infancy, only a small proportion of the favorable sites being improved. The following summary of the power in use in this basin, taken from the reports on the Water Power of the United States, published by the Tenth Census, vol. xvii, page 361, ex-

hibits the importance of this river and its tributaries to the local industries rapidly being developed upon the Great Plains:

Stream.	Tributary to what.	State.	Number of mills.	Total fall used.	Horse-power of wheels.
Kansas	Missouri	Kansas	9	8	317
Delaware	Kansas	do	7	64	377
Big Blue	do	Kan. and Neb.	16	103	1,022
Little Blue	Big Blue	do	13	103½	637
West Fork Blue	do	Nebraska	8	80	340
North Fork Blue	do	do	4	35	242
Smoky Hill	Kansas	Kansas	7	59½	442
Solomon	Smoky Hill	do	11	98½	657
North Fork Solomon	Solomon	do	8	104	298
South Fork Solomon	do	do	2	17	114
Saline	Smoky Hill	do	6	72	199
Republican	Kansas	Kan. and Neb.	7	43	356
Prairie Dog	Republican	do	6	71	152
Sundry small streams.	Kansas and tributaries.	do	41	486½	1,408
Total, Kansas river and all tributaries			145	1,345	6,561

GEOGRAPHIC LITERATURE

DE LAPPARENT'S LEÇONS DE GÉOGRAPHIE PHYSIQUE

Leçons de Géographie physique. By A. de Lapparent. Pp. 590, with many illustrations, maps, and diagrams. Paris: Masson et Cie. 1896.

M. A. de Lapparent, professor in the *Ecole libre de hautes études* in Paris and lately president of the French Geographical Society, lays us under many obligations by the preparation of this valuable work. An accomplished field geologist, as evinced, for example, in his monograph on the peculiar deformation in the Paris basin known as the Pays de Bray; author of a compendious treatise on geology, the leading work of its kind in the French language; a presiding officer as notable for his courteous tact as for his competence in his subject, he now discloses a close acquaintance with a line of study that as yet is hardly acclimated in Europe, namely, the American science of geomorphology, whose principles and name he adopts together. Although his references to American sources overweight the relative importance of contributions from certain quarters, he has clearly seized the essentials of the rational as against the empirical method of geographical description. The initial forms produced by

uplift, deformation, or other genetic processes, the succeeding work of the agencies of erosion, the control of dissection by the effective baselevel, the gradual and systematic progress in dissection as determined by the advance in time through the geographical cycle, and the termination of the normal uninterrupted cycle of erosion in a plain or peneplain of subaerial denudation, all these and many other essential features of the American treatment are succinctly presented. Numerous illustrative examples, largely taken from European sources, are presented; these being of particular value to our students of the subject, who are naturally more familiar with American occurrences. Following the statement of general and special principles, there comes an account of Europe in particular and of the world in less detail, which is, I believe, the first serious attempt to treat areal geography in this fashion. Local geomorphological studies have been attempted elsewhere, but no one has hitherto undertaken to discuss the physical geography of the world on these new lines. It goes without saying that the treatment must be very unequal, for the physiography of many parts of the world is now as little known as the fauna and flora of the remoter regions were known a century ago.

It is manifest from an examination of this book, as well as from the study of various other sources, that the morphology of mountains is in a much less advanced state than that of simpler structures. Students of the subject will therefore do well to give particular attention to remedying this deficiency. At present we read frequently about the height and length of ranges, about the rocks of which they are composed, and about the influence of mountains on climate, both local and adjacent, as well as about their control of the character and distribution of plants and animals, but it is very seldom that any critical or detailed morphological account is given of the mountains themselves. Their forms are so various, so ungeometrical, that they have not yet been reduced to system and embodied in a satisfactory terminology, indicative of structure on the one hand and of stage of destructional development on the other. Thus de Lapparent's account of the concentric escarpments of the Paris basin is more systematically complete than his description of the Pyrenees; a clearer idea is given of the topography characterizing the simplified forms of the old mountains of the middle Rhine than of the complicated forms of the still vigorous Alps. This is not to be avoided in the present stage of the science, but nothing will aid more in carrying us past this stage than the preparation of sound general treatises like the one before us. Its perusal must turn many students toward further investigation, and new investigators are greatly needed.

In the matter of citations, the author has been sparing, but this is to be the less regretted on account of the exhaustive bibliographic treatment of geomorphology in Penck's recent *Morphologie der Erdoberfläche* (2 vols., Stuttgart, 1894). The latter book presents an exceptionally full account of the historical development of physical geography, while the former presents a concise account of its present advanced condition, and thus the two works complement each other very satisfactorily.

Whether in preparation for a trip abroad or for use in study and teaching at home, de Lapparent's *Leçons* must prove very acceptable to American geographers.

W. M. Davis.

ANNUAL REPORT OF THE SUPERINTENDENT OF THE UNITED STATES COAST AND GEODETIC SURVEY

This report is still in the hands of the Public Printer, but by the courtesy of Gen. W. W. Duffield, Superintendent of the Survey, THE NATIONAL GEOGRAPHIC MAGAZINE is permitted to present its readers with the following summary of its contents:

The report covers the fiscal year ending June 30, 1895. It gives the progress of the work in the field and office with the customary detail, and the necessary references to several boundary surveys and other special surveys of precision of the class usually assigned to this bureau.

Upwards of seventy-five parties were actively engaged in the various branches of the field operations. Work was carried on within the limits or on the coasts of sixteen states and territories along the seaboard and in nine states and territories in the interior. It included reconnaissance, base-line measures, triangulation, topography, hydrography, physical hydrography; time, latitude, longitude, and azimuth determinations; boundary-line surveys, geodetic leveling; magnetic declination, dip and intensity observations; laying out meridian lines, gravity determinations; tidal and current observations; oyster-bed surveys, etc.

Among the surveys of special importance are the completion of the topographic and hydrographic resurvey of Boston harbor and vicinity; the beginning of the resurvey of Buzzards bay; the continuation of the telegraphic longitude determinations in the southwest; the progress on the transcontinental triangulation in Colorado and the oblique arc in Alabama; points furnished in aid of state surveys in Tennessee, Kentucky, New Jersey and Minnesota; the completion of the reconnaissance of the Rio Grande from its mouth to El Paso; the completion of the resurvey of Pensacola bay and its tributaries; the surveys for the location of the boundary line between southeastern Alaska and British Columbia; the survey of the California oblique boundary line and the topographic and hydrographic resurvey of San Francisco bay and harbor.

The line of precise spirit-levels from tidewater was continued to Kansas City, and the usual progress was made in surveying those portions of the coasts not yet fully charted, including the channels of Washington sound, the strait of Fuca, and the hydrographic development of the intricate channels of the Alexander archipelago in southeast Alaska.

The report records the death of Lieut. F. H. Crosby and four men engaged in the prosecution of the field work, who were drowned while attempting to land through the surf on the coast of Washington. This is commented upon as the most serious casualty that has happened to any of the field parties of the Survey since the loss of the *Walker* in 1856.

In accordance with the provisions of law, one of the assistants has continued to serve as a member of the Mississippi River Commission, and another, by appointment of the President, is a member of the International Boundary Commission, organized for the location of that part of the United States and Mexican boundary line extending from El Paso to the Pacific. At the request of the Secretary of the Navy two assistants were temporarily detailed, one for special triangulation in connection with

marking the speed trial course in Long Island sound, and the other for a survey on a large scale of the vicinity of the dry dock at Port Orchard, Puget sound. Assistants were detailed during the year at the request of the Governor of Virginia for surveys of the Virginia oyster beds, and a special survey of the Fox islands, Chesapeake bay, for the settlement of some questions of riparian rights, and at the request of the Commissioner of Fish and Fisheries to make further examination of the oyster beds in Mobile bay and vicinity. The detail of an assistant for the Massachusetts State town boundary survey also continued during the greater part of the year. The surveys for the location of the boundary between Alaska and British Columbia, that have been conducted by the Superintendent for several years past in his capacity as commissioner on the part of the United States, were continued during the season of available working weather, and the parties organized in the spring of 1895 completed all the work necessary for the compilation of the maps required. Under the head of special surveys, mention is also made of the act of Congress of August 1, 1894, requiring the Superintendent to lay out a circle around the new Naval Observatory for the deflection of the street extensions of the city; the work was duly completed and the results with maps showing location delivered to the Navy Department.

The report of operations in the office is given in great detail. The publications of the Survey relate essentially to the navigation of the coasts of the United States; but in the preparation of the tide tables for the new year a commendable departure seems to have been made by including predictions for the principal ports of the world. Seventy-five new charts were issued and one hundred and twenty-eight charts were revised and reissued. The new chart publications complete the series of the Atlantic and Gulf coasts on the uniform scale of 1 : 400,000, designed especially for the use of navigators, and the series on the coast of Maine on the large scale of 1 : 40,000, designed for the safe navigation of the intricate passages of that broken and rock-bound coast. The distribution of charts during the year is reported at 51,456 copies, more than half the number having been sold by the agents in the principal maritime cities. There were also distributed 114,000 copies of the monthly notices to mariners, describing the important hydrographic developments and changes in aids to navigation on the coasts of the United States.

The "Bureau of Standard Weights and Measures," which is also under the direction of the Superintendent of the Survey, reports that duplicate sets of standards had been furnished the states of North and South Dakota, besides the customary routine work. Reference is also made to the new Kilo balance of precision recently obtained by the Bureau. It is a duplicate of the balance of the International Bureau and is the second brought to this country. The other is in the Smithsonian Institution and was used by Professor Morley in the determination of atomic weights. The special features of these balances are auxiliary devices which enable the observer to note the oscillations of the beam from a distance and to interchange the weights upon the scale-pans without approaching the balance. The probable error of a single weighing with a load of one kilogramme is only $\pm 0^{mg}.0236$.

In presenting his estimates for the next year the Superintendent urges a moderate increase in the appropriation for field work as necessary to the rapid and economical prosecution of the surveys urgently demanded in the interests of commerce along our coasts, and for the advancement of other important field operations of the survey, which, he states, are found to be impracticable with the amount appropriated for the current year. The estimates contemplate resurveys of several important harbors on the Atlantic and Pacific coasts; also the commencement of a survey of the Aleutian islands and an examination of the mouths of the Yukon river in Alaska in addition to the work in progress.

Besides the publications referring to nautical matters, the survey issues bulletins at irregular intervals intended to impart advance information on new discoveries or other matter relating to the survey; and appendices to the report of the Superintendent giving scientific results and other developments incidental to the progress of the work. Four bulletins were issued during the year and the report has appendices on the following subjects: The Secular Variation in Direction and Intensity of the Earth's Magnetic Force in the United States and Some Adjacent Countries; Observations of the Transit of Mercury at Washington in 1894; Results of Latitude and Longitude Determinations in Alaska; Physical Hydrography, Nantucket, Mass.; Notes on the Specific Gravity of the Waters of the Gulf of Mexico and the Gulf Stream; A Graphic Method of Reducing Stars from Mean to Apparent Places; A Description of Improved Leveling Rods and a Report on the New Kilo Balance of Precision.

HERBERT G. OGDEN.

MISCELLANEA

In Santo Domingo important governmental concessions have been granted to an American corporation. From Puerto Plata, a seaport of 18,000 inhabitants, at which from 12 to 15 steamers enter monthly, a railroad is being constructed to Santiago and Mora.

American capitalists have purchased the entire street-railway system of the city of Mexico, comprising 100 miles of broad gauge and 60 miles of narrow gauge, over which seventeen and one-half millions of passengers were carried in 1895. Electric traction and other improvements are contemplated.

Two summer courses in physiography will be given by Professor W. M. Davis at Harvard University, beginning July 3 and lasting six weeks. The chief object of the elementary course is to promote the change in the method of teaching geography so generally advocated in recent years, and the lectures will be supplemented by laboratory work and excursions. The advanced course will be specially adapted to the needs of those already well grounded in the elements of physiography. The admirable library and laboratory resources of the university will be available for the use of students, and as the fee for either course is only $20, there should be a large attendance.

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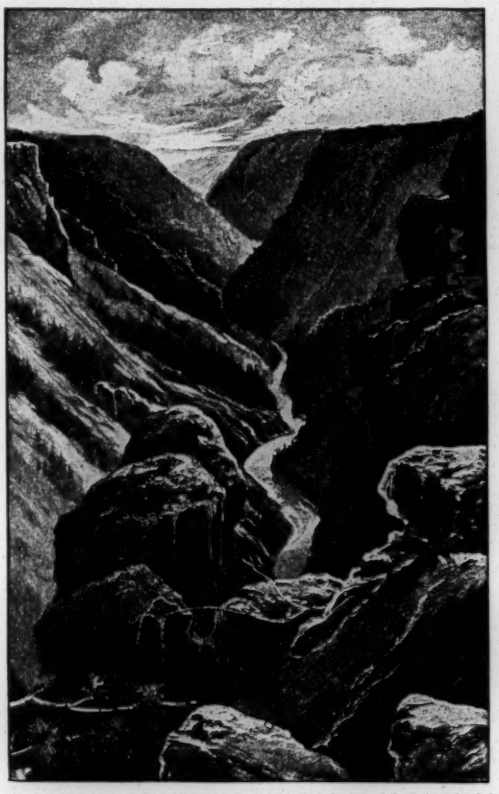

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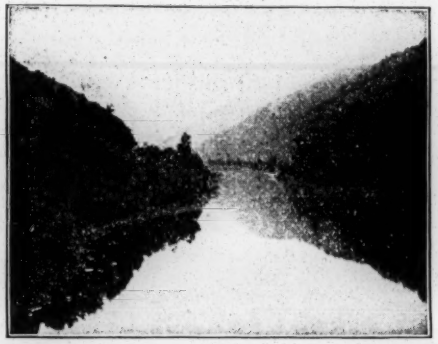

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JANUARY.—Russia in Europe, with map, Hon. Gardiner G. Hubbard; The Arctic Cruise of the U. S. Revenue Cutter "Bear," with illustrations, Dr. Sheldon Jackson; The Scope and Value of Arctic Exploration, Gen. A. W. Greely, U. S. A.

FEBRUARY.—Venezuela: Her Government, People, and Boundary, with map and illustrations, William E. Curtis; The Panama Canal Route, with illustrations, Prof. Robert T. Hill; The Tehuantepec Ship Railway, with maps, E. L. Corthell, C. E., LL. D.; The Present State of the Nicaragua Canal, Gen. A. W. Greely; Explorations by the Bureau of American Ethnology, W J McGee. *Also map of the Orinoco valley, showing territory drained by that waterway and its bearing on the Venezuelan Boundary Question.*

MARCH.—The So-Called "Jeannette Relics," Prof. Wm. H. Dall; Nansen's Polar Expedition, Gen. A. W. Greely; The Submarine Cables of the World, Gustave Herrle; The Survey and Subdivision of Indian Territory, with map and illustration, Henry Gannett; "Free Burghs" in the United States, James H. Blodgett. *Also chart, 49 x 30 inches, showing Submarine Telegraph Cables of the World and Principal Land Lines. Full-page portraits of Dr. Nansen and Prof. Wm. H. Dall.*

APRIL.—Seriland, with map and illustration, W J McGee and Willard D. Johnson; The Olympic Country, with map, the late S. C. Gilman; The Discovery of Glacier Bay, Alaska, Eliza Ruhamah Scidmore; Hydrography in the United States, Frederick H. Newell; Recent Triangulation in the Cascades, S. S. Gannett; The Altitude of Mt. Adams, Washington, Edgar McClure.

MAY.—Africa since 1888, with special reference to South Africa and Abyssinia, with map, Hon. Gardiner G. Hubbard; Fundamental Geographic Relation of the Three Americas, with map, Prof. Robert T. Hill; The Kansas River, Arthur P. Davis. *Also portrait of Hon. Gardiner G. Hubbard, President of the National Geographic Society.*

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